Chapters 6, 12 and 17: The Basic Vocabulary of Thermodynamics

Thermodynamics describes the macroscopic properties of matter, and predicts how energy affects these properties. The laws of thermodynamics are empirical; they cannot be derived from more fundamental concepts. The power of thermodynamics (and its weakness!) is that it does not depend on any theory of the structure of matter (Chapters 7-10).

System: The region of space of interest, with physical or mathematical boundaries. E.g. the reactants and products of a chemical reaction, or a sample of an ideal gas.

Surroundings: The rest of the universe (!); external to system.

State: (1) A system with measurable values of $P$, $V$, $n$, $T$, and (2) A system at equilibrium-- no net observable change

$$P_{sys} = P_{ext} = P \text{ and } T_{sys} = T_{ext} = T$$

State Function: (1) A property used to define a state $(P, V, n, T)$, or

(2) A property whose change in value depends only on initial and final states: E.g. $\Delta P$, $\Delta V$, $\Delta n$, $\Delta T$, $\Delta H$

State functions are path independent.

Non-State Function: A physical quantity (e.g. heat ($q$), work ($w$)) that characterizes the process of going from one state to another

Non-state functions are in general path dependent (don't use $\Delta$)